

**FIRST RECORD OF *NEOSCOPELUS MACROLEPIDOTUS* JOHNSON, 1863
(ACTINOPTERYGII: MYCTOPHIFORMES: NEOSCOPELIDAE) FROM IRISH WATERS
(PORCUPINE BANK, NORTH-EASTERN ATLANTIC)**

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Abstract. The blackchin, *Neoscopelus macrolepidotus* Johnson, 1863 (known also as large-scaled lanternfish), originally discovered at Madeira, is a globally distributed benthopelagic fish species that inhabits depths between 300 and 1100 m in the tropical and subtropical regions. Despite the sampling site of the original description, the species seems to be very rare in the eastern Atlantic, particularly at northern latitudes. The worldwide distribution of the species seems to be restricted to latitudes lower than 45° either in the Southern and Northern Hemisphere. During the Porcupine 2016 bottom trawl survey a specimen of *N. macrolepidotus* was collected at a depth of 628 m and latitude 51°N in the Porcupine Bank, situated in the north-eastern Atlantic, approximately 204 km off the west coast of Ireland. This is the first record of the species in the Porcupine Bank. It significantly extends the distribution range of *N. macrolepidotus* and represents the highest latitude reported for this species either in the Northern or Southern Hemisphere. This extended distribution may have been facilitated by the course of the Mediterranean Outflow Water, which on its way to the north-eastern Atlantic reaches the slope of the Bank at depths where *N. macrolepidotus* is usually distributed.

Keywords: blackchin fish, highest latitude record, extended distribution, Mediterranean Outflow Water

INTRODUCTION

The genus *Neoscopelus* was established to accommodate the species *Neoscopelus macrolepidotus* Johnson, 1863, discovered at Madeira (Johnson 1863). The latter fish, known under alternative common names of blackchin or large-scaled lanternfish, is a globally distributed benthopelagic species that inhabits depths between 300 and 1100 m in tropical and subtropical regions (Nafpaktitis 1977, Hulley 1986, 1990, Burgess and Branstetter 1985, Lloris 1986, Roberts 2015). Along with *Neoscopelus microchir* Matsubara, 1943, with which shares similar morphological traits, these are the only two species of *Neoscopelus* reported from the Atlantic Ocean. The third species described within this genus, *Neoscopelus porosus* Arai, 1969, is only distributed in the Indo-Pacific region.

In the Atlantic, the majority of the records of *N. macrolepidotus* come from the tropical and subtropical western Atlantic. *Neoscopelus macrolepidotus* was recorded

from off Dominica, off Martinique, and the northern Gulf of Mexico by Goode and Bean (1896), from off southern Brazil and off northern Argentina south to 38°38'S by Nafpaktitis (1977) and from various locations in the Gulf of Mexico, Caribbean Sea, and off northern Brazil by Burgess and Branstetter (1985). Recently, the distribution range in the north-western Atlantic was extended northwards by Moore et al. (2003), with a new record at 40°45'N off Cape Hatteras (North Carolina, USA).

In the eastern Atlantic, *Neoscopelus* species seem to be very rare. In the north-eastern Atlantic, further than the first record of the genus *Neoscopelus* (i.e., the specimen from Madeira used in the original description of *N. macrolepidotus*), there have only been few other records from the following areas:

- Morocco (Vaillant 1888);
- Madeira (Maul 1951);
- Western Sahara (Maurin et al. 1977);
- Namibia (Lloris 1986);

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- The south-eastern central Atlantic at 38°–39°S (Bekker and Shcherbachev 1990).

The Galician coast and the Galician Bank (a large seamount located at 230 km off the Galician coast), both areas at 42°–43°N (Bañón et al. 1997, 2016). The latter are the northernmost records of the species in the Atlantic (Fig. 1).

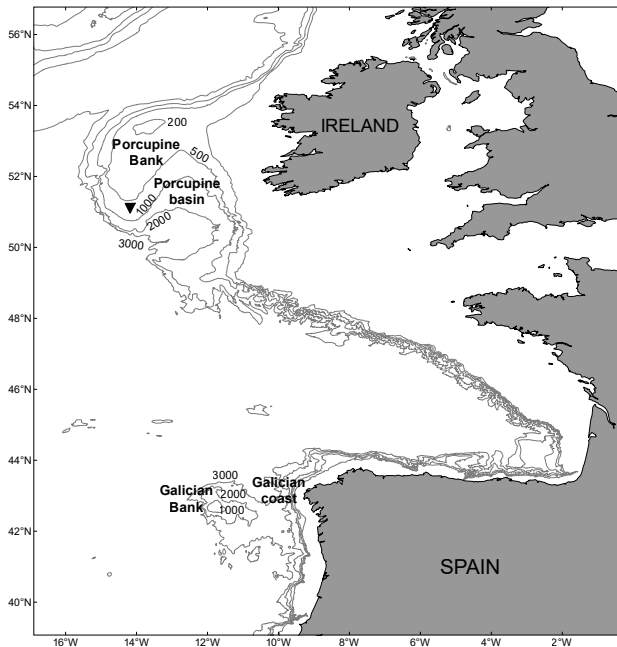


Fig. 1. Map showing the location of the bottom trawl sampling station where the specimen of *Neoscopelus macrolepidotus* was collected in the Porcupine Bank (▼); It also shows the areas off Galicia where the previous northernmost records for the species in the Atlantic had been reported; The isobaths corresponding to 200, 500, 1000, 2000, and 3000 m are also shown

Otherwise, the *Neoscopelus* species are known to occur north to 40°45'N in the north-western Atlantic (Moore et al. 2003), south to 38°38'S in the south-western Atlantic (Nafpaktitis 1977), south to ca. 40°S in the south-eastern Atlantic and Indian Ocean (Bekker and Shcherbachev 1990), north to ca. 30°N in the north-western Pacific (various authors), and south to 44°S at Chatham Islands (New Zealand), in the south-western Pacific (Roberts 2015). So far, the New Zealand findings represent the highest latitude records of the genus *Neoscopelus* and of the species *N. macrolepidotus* in the Southern Hemisphere.

The present work reports the first, and the highest latitude, record of the genus *Neoscopelus* and the species *N. macrolepidotus* from the Porcupine Bank (off the west coast of Ireland).

The specimen studied was collected during the bottom trawl survey PORCUPINE 2016. The survey was carried out on board of the R/V *Vizconde de Eza* at the Porcupine Bank. The fishing gear used during the survey was the otter bottom trawl Porcupine Baca 40/52 (Anonymous 2010) with a codend mesh size of 20 mm. The specimen

was preserved in 70% ethanol and is now deposited in the collection of the Instituto Español de Oceanografía in the Centro Oceanográfico de Santander with the reference number IEO-ST-PC16/056.

The Porcupine Bank is situated in the north-eastern Atlantic, approximately 204 km off the west coast of Ireland (Fig. 1), within the Irish EEZ. The shallowest depth on top of the Bank is at 150 m. It is limited at its western part by a steep drop-off that descends abruptly from around 450 to more than 3000 m. The eastern part is connected to the Irish shelf by the narrow Slyne Ridge, with a depth of around 330 m. In the north the slope is also steep and limited by the Rockall Trough with depths between 2000 and 3000 m, whereas the slope in the southern part is not so steep, forming in the south-eastern region, between the Bank and the Irish shelf, the Porcupine Seabight (Velasco et al. 2008).

The individual (143 mm standard length) was caught at a depth of 628 m, at 51°06.07'N and 014°10.98'W (Fig. 1). The net and the abundant catch in that sample [383 kg in total, including 136 kg of *Argentina silus* (Ascanius, 1775), 49 kg of *Micromesistius poutassou* (Risso, 1827), 29 kg of *Lepidion lepidion* (Risso, 1810), 25 kg of *Phycis blennoides* (Brünnich, 1768), and 24 kg of *Galeus melastomus* Rafinesque, 1810]. Although the studied specimen was slightly damaged (Fig. 2), the meristic and morphometric traits required for its identification could be obtained (Table 1). Most fins were damaged, including the caudal, which prevented us from measuring the total length. The ventral part was damaged. Even though, gonads were not lost, allowing us to determine that the specimen was a female. The presence of the adipose fin is typical for species of the family Neoscopelidae, and the photophores characterise it as a species of the genus *Neoscopelus*. The species was identified as *N. macrolepidotus* due to the presence of a single lateral luminous organ series (LO) (4 in *N. porosus*) consisting of 12 photophores that ended before the anal fin (20–22 photophores ending near the posterior end of the anal fin in *N. microchir*) (Fig. 2), and 2 + 1 + 8 (total 11) gill rakers (3 + 1 + 10, total 14 in *N. microchir*). Other morphometric and meristic traits are summarized in Table 1.

The presently reported record significantly extends the distribution range of the genus *Neoscopelus* and the species *N. macrolepidotus* further north. At 51°N it represents the highest latitude reported for this species either in the Northern or Southern Hemisphere. Moreover, this record is added to the recently reported ones of *Gadella maraldi* (Risso, 1810) and *Bellottia apoda* Giglioli, 1883 from the slope of the Porcupine Bank. Those cases also represented a significant northward extension of the previous distribution of both species, whose northernmost distribution was considered the waters off the Iberian Peninsula at 43° and 37°N for *G. maraldi* and *B. apoda*, respectively (Ruiz-Pico et al. 2012, Fernández-Zapico et al. 2013).

Although the Porcupine Bank is situated at a latitude of more than 50°N, its slope is influenced by the relatively warm and saline Mediterranean Outflow Water (MOW), a

Table 1 Morphometric and meristic characteristics of the specimen of *Neoscopelus macrolepidotus* (IEO-ST-PC16/056) from the Porcupine Bank

Morphometric and meristic characters	Value
SL	143.5
Head length	45.5
Preorbital length	9.6
Eye diameter	9.9
Interorbital length	8.3
Predorsal length	61.5
Dorsal-fin base length	9.0
Anal-fin base length	6.9
Preal length	103.8
Origin adipose fin to caudal peduncle	25.6
Upper maxilla length	24.2
Body width	15.4
Depth at anal fin origin	25.9
Weight	42.0
Dorsal-fin rays	12
Anal-fin rays	11
Pectoral-fin rays	18
Pelvic-fin rays	8
Gill rakers	2 + 1 + 8 (11)
LO	12

Lengths are in mm; weight in g; LO: number of photophores in the lateral luminous organs series.

water mass originating in the deep Mediterranean Sea that outflows into the north-eastern Atlantic Ocean through the Strait of Gibraltar. Despite the flux of MOW through the Strait of Gibraltar is relatively small, on the order of $10^6 \text{ m}^3 \cdot \text{s}^{-1}$, the northward penetration of this water mass is of great interest due to it is involved in the water mass distribution of the North Atlantic, and because it is believed to be a source of heat and salt for the Nordic seas, which involves a potential role in the World Ocean circulation (Jia et al. 2007, Lozier and Steward 2008). The

MOW flows northward as a mid-depth boundary current along the west coast of the Iberian Peninsula, reaching Bay of Biscay, and onward toward Porcupine Bank (Lozier and Steward 2008). This water mass exits the Strait of Gibraltar with a salinity of 38.4‰*, which decreases in its way northwards to a mean salinity of 35.65‰ in the Bay of Biscay (Iorga and Lozier 1999), still higher than the salinity of the other two main sources of water in the North Atlantic basin, the sub-polar water (<35‰) and the subtropical water (>35‰ and <35.6‰) (Chaudhuri et al. 2011). The influence of the MOW in the north-eastern Atlantic has been related to climatic variability, with MOW reaching higher latitude in years with negative values of the North Atlantic Oscillation (NAO). In such cases, MOW could penetrate past Porcupine Bank into the sub-polar gyre (Lozier and Steward 2008, Chaudhuri et al. 2011).

The catch of the specimen reported here could have been originated by the migration of individuals from the closest reported north-eastern Atlantic populations, those in the Galician Bank and the continental slope of the Galician coast (Bañón et al. 1997, 2016). This migration could have been facilitated by following the relatively warmer MOW on its way to the north-eastern Atlantic during a period of low NAO and higher influence of MOW on the Porcupine bank. In these periods, the MOW is present on the slope of the Porcupine Bank in depths between 400 and more than 2000 m (Chaudhuri et al. 2011), a bathymetric range that includes those depths where *N. macrolepidotus* is usually found.

The MOW contribution to the northward distribution of species from lower latitudes has already been suggested before by De Mol et al. (2002, 2005) who hypothesized that the large deep-water coral banks of *Lophelia* and *Madrepora* in the Porcupine basin could have been originated by the introduction of larvae transported by the MOW from the Mediterranean to the northeast Atlantic. The same pathway of dissemination has also been suggested for the Polynoidae polychaetes, *Harmothoe*



Fig. 2. Specimen of *Neoscopelus macrolepidotus* from the Porcupine Bank (IEO-ST-PC16/056)

* In the wake of the growing criticism of the Practical Salinity Scale concept (and especially PSU as a “unit”), Acta Ichthyologica et Piscatoria is in favour of expressing salinity in parts per thousand (‰), regardless if a direct or indirect method was employed to determine the water salinity.

vesiculosa and *Neolagisca jeffreysi* which live associated to deep-water coral banks and have only been found in the western Mediterranean and scattered places in the north-eastern Atlantic including the southwest of Ireland (Fiege and Barnich 2009). Along with the recent new records of *B. apoda* and *G. maraldi* in the Porcupine bank, the presently reported record of *N. macrolepidotus* adds evidences for the possible role of MOW in the northward dissemination of fish species from lower latitudes.

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